P-92

Restricted geometry effect on Phase Transitions in Rb_2ZnCl_4

L.S. Stekleneva[1], E. Rysiakiewicz-Pasek[2], V.S. Bondarev[3], I.N. Flerov[3], M.S. Molokeev[3], L.N. Korotkov[1]

[1] *Voronezh State Technical University, Moskovsky pr. 14, 394026, Voronezh, Russia*
[2]*Faculty of Fundamental Problems of Technology, Wroclaw University of Science and Technology, 50-370, Wroclaw, Poland*
[3]*Kirensky Institute of Physics, Federal Research Center KSC SB RAS, 660036, Krasnoyarsk, Russia*
e-mail: lubov_stekleneva@mail.ru

The physical effects in conventional nanosized ferroelectrics have been studied to some extent at present. At the same time, the problems associated with the appearance of an incommensurate phase, its temperature evolution, and the transition to a commensurate polar phase under conditions of restricted geometry have not been practically investigated.

Suitable objects for such studies are nanocomposites based on Rb_2ZnCl_4, which in the bulk state undergoes transition from paraelectric to incommensurate phase near $T_i \approx 303K$ and transition from incommensurate to ferroelectric phase in the vicinity of $T_C \approx 192K$. These transitions are accompanied by distinct anomalies of dielectric permittivity ε.

The purpose of the present work is calorimetric, dielectric and X-ray investigation of Rb_2ZnCl_4 - SiO_2 nanocomposites.

The matrix nanocomposites of Rb_2ZnCl_4 - SiO_2 system were prepared by embedding of Rb_2ZnCl_4 into porous glasses with average diameter of through pores near 320, 160, 46 and 23 nm from saturated aqueous solution (Abbreviations of the samples are RS-23, RS-46, RS-160 and RS-320). X-ray analysis (Cu-Kα radiation) showed that the crystallized in porous material and bulk Rb_2ZnCl_4 possess identical crystalline structure.

Analysis of powder patterns revealed that (2/3 2 0) peak appeared at 300K and its intensity increases under cooling. There were not found any other superstructure peaks under cooling.

Results of dielectric and calorimetric measurements are presented in Figures 1 and 2.

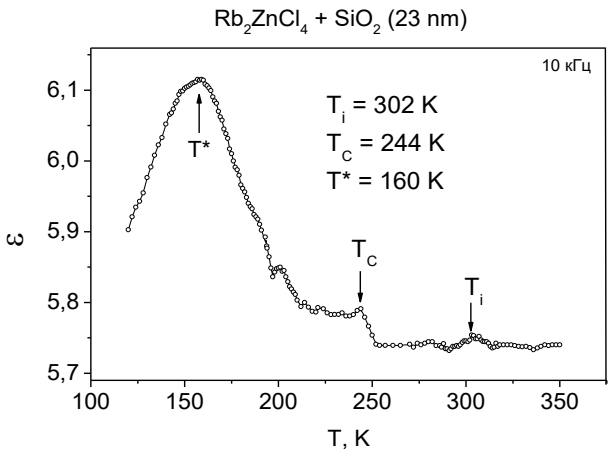

Figure 1. Temperature dependence of the dielectric permittivity for RS-23 sample

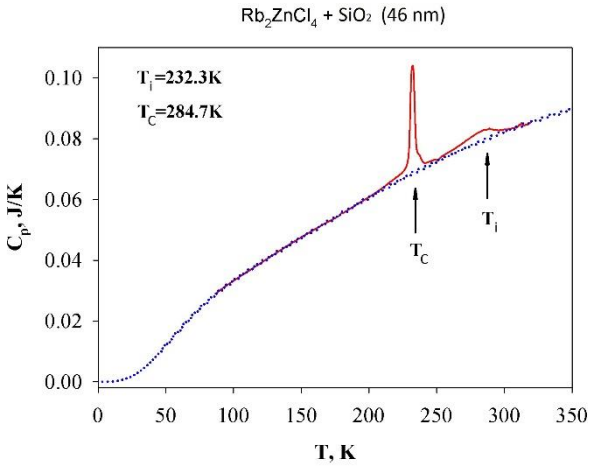

Figure 2. Temperature dependence of the heat capacity for RS-46 sample

Three anomalies of dielectric permittivity (ε) at temperatures of about 160, 246 and 302 K for RS-23, RS-160 and RS-320 samples were found (Fig. 1). The weak maximum of ε at T_{i2}=302K coincides with the diffused maximum of heat capacity C_p (Fig. 2). The distinct peak of C_P near 232K is accompanied by the step-like anomaly of ε (≈ 244K). These anomalies are associated with the ferroelectric phase transition that in the single crystal of Rb_2ZnCl_4 is observed at $T_C \approx 192K$.

The diffused maximum of ε near T* = 160K is not accompanied by any peculiarities in the $C_P(T)$ dependence. The origination of this maximum of ε is discussed.